



Observatory Integration and Test at NRL

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OBSERVATORY AIT



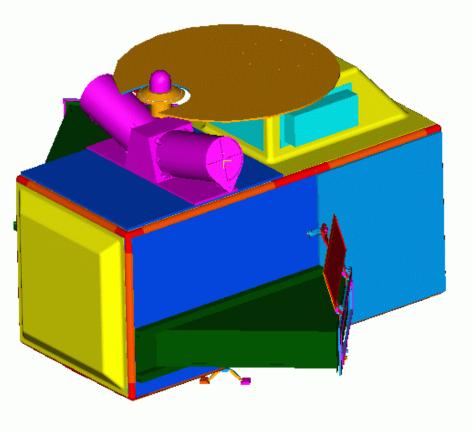
- Instrument Delivery to NRL
- Instrument Receiving and Inspection
- Post Delivery Acceptance Test (NRL Buy off)
- Star Tracker/Omni Antenna Installation
- Instrument Integration to the S/C Bus
- First Full Functional (Ambient Condition)
- Test Readiness Review
- Magnetic Balance
- EMI/EMC
- Spin Balance & Mass Properties
- Modal Testing & Jitter Testing (If Required)
- Random Vibration, Acoustic
- Pyro Shock/ Mechanism Deployment
- TVAC (Instrument doors deployment, and FPA Excitation)
- End to End Compatibility Test (With Ground Station)
- Post Environmental Test Full Functional
- Post Environmental Test Alignment Verification
- Pre-Ship Readiness Review
- Test Complete

Ship to KSC



Instrument Delivery to NRL





- Deliver to NRL
 - Instrument Configuration
 - In Shipping Container with
 - GN2 purge for Humidity.
 - Shock Monitors
 - Doors Closed
 - Triple Bagged
 - Grounded to Container
 - GSE
 - Mechanical
 - ◆ Lifting Frame
 - Rotation Frame
 - Instrument Drill Template
 - Electrical
 - ◆ S/C Power Rack
 - Data Collection Computers
 - Command & Control S/W
 - > Telemetry Data
 - ◆ Temperature Control
 - Thermal
 - ◆ Instrument for 10°C Ops (TBD)
 - Contamination Control
 - ◆ GN2 Purge Suitcase



Transportation Requirements

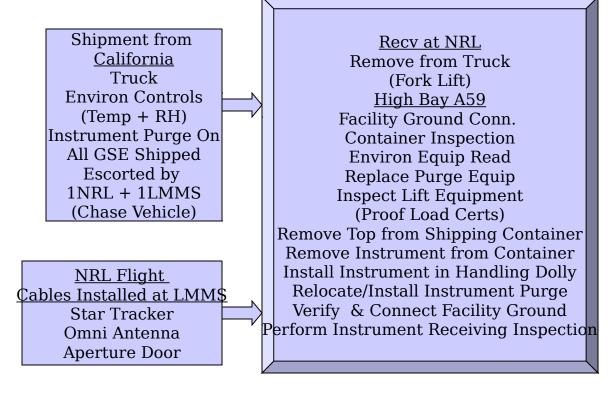


- Shipping container
 - Modify Shipping Container to Accept ECD
 - Instrument Handling Dolly (FLOTRON)
 - GN2 Purge Connections, Environment Monitors/Recorders
 - External Ground lug
 - Fork Lift at NRL to move shipping container
 - Shipping Container Road Covers (Vendor (Scott))
 - Transport Environments (3Gs all axes) requires an Air Ride Trailer (Double Drop)
- Complimentary Equipment
 - EGSE and Power Rack
 - TGSE
 - Lifting Slings and Associated Lift Hardware
 - Lifting Sling and Spreader Bar (Long Throw into Shipping Container)
 - Wire Ropes for Lift Fixture for Container Integration



Instrument Receiving and Inspection

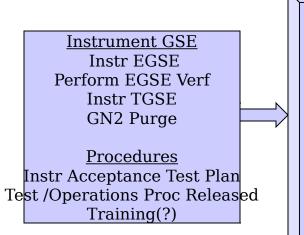






Post DeliveryAcceptance Test (NRL Buy off)





NRL Facility
GN2
Facility Power
Class 1000 Clean Room
Clean Room Supplies
Clean Room Facility Ground

Post Delivery FAME Instrument Acceptance Test

<u>Connections</u> Instrument TGSE Instrument EGSE

Establish Operating Environment
Establish EGSE Comm to Instr
Telemetry Data
Instrument Thermal Control
FPA at 10°C
Purge System Off
(During Data Collection)

Instrument Test
Charge Injection
FPA LED Flat Field
FPA Focus LD

Active Focus Adjustment and Return to have Door 'OPEN' Command

(Door Bag)

Manually closed Door TGSE off, Heat ^oFPA to 22^oC GN2 Purge on NRL Buy OFF

Buy Off Criteria

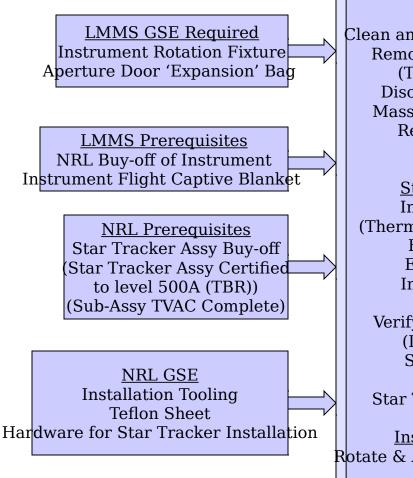
Defined in Acceptance

Test Plan



Star Tracker/Omni **Antenna Installation**





Instrument Prep Clean and Remove Mass Sim Bad Remove Instr Star Tracker (Tear-Away Blanket) Disconnect Star Tracker Mass Sim Ground + Cable Remove the Tracker Mass Simulator Star Tracker Install **Install Star Tracker** (Thermal and Mechanical I/F) **Electrical Ground** Electrical Cable(s) Install Antenna Hat (2lbs) Verify Surface Cleanliness (Level 500A (TBR)) Star Tracker Dust. Cover Installed Star Tracker Bag Installed Install Flight Blanket Rotate & Add Captive flight Blanket



Instrument Integration to the S/C Bus



LMMS GSE Required Instrument Lift Fixture **Drill Template**

Prerequisites **LMMS**

Doors Closed GN2 Purge On **EGSE** Disconnect **Instrument Grounded** NRL

Forward Ring Drilled /Insp **Bus Leveled**

Star Tracker Assy Installed S/C Grounded **Install Tank MLI Instrument Integration** Procedure Released

NRL GSE

1000 LB cap Hydroset Inclinometer Optical Inspection Equipment

> NRL Flight Hardware Instrument Shims

Instrument Preps Verify S/C Level

Inspect and Clean Instr Mount on Bus

Attach lift fixture and Hydroset (to Instrument)

Offload weight and remove Screws Lift the Instrument

(Level instrument in Lift Fixture) Inspect and Clean Flexures

Translate over Bus

Verify Instr to Bus Orientation

Lower Instr to Bus (Crane/Hydroset)

Instrument Contact

Install Bolts

Off load Instr Weight to Bus **Torque Mounting Bolts**

Verify IAC-STC-BAC

Shim as required for

Instrument to Bus Align Final Mounting Torque Verf

Electrical Connections Connect Instr to Bus Grnd Perform Ground Audits Remove Instr Facility Grnd Verf Elec Power Polarity Clean and Inspect Connectors Flight mate Connectors and Coax Torque and Stake Connectors

> Ínstrument to Bus Complete

Instrument Mount bolts



First Full Functional (FPA @10°C)



LMMS GSE Instr TGSE GN2 Purge

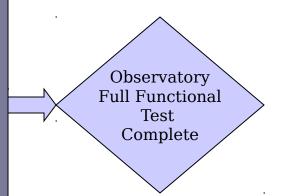
NRL Prerequisites
Antenna Hats Installed
BUS EGSE Verf
(Power,Software, Cmd)
NRL Test Procedure Released

<u>NRL GSE</u> Test Racks and Cables Antenna Hats

Electrical Connect Coax to Antenna Hat. Connect Instr TGSE to Radiator Instr GN2 Purge Apply Instrument Power **Apply Electrical Power** (Verf power Start-up Sequence) Perf Bus Elec Fuctional Test. Verfiy Instr Passive Telemetry Perform Instr Elec Verf Test Establish Instr Temp Control Instr FPA to 10°C GN2 Purge Off (During data Collection) CI, Flat Field, Instr Focus FPA LD **Active Focus Drive** Centroid Testing(TBD) Doors Open Command

Terminate Functional Test
Manual Door Close
GN2 Purge On
Remove Instrument TGSE
FPA to 22°C

Observatory Power Off



24-25 Apri



Test Readiness Review



Prerequisites

- •Instrument Buy -Off Complete
- •Bus Buy Off Complete
- •Environmental Test Procedures Release
- Open Item Audit and Evaluation (DRs, NMRS)
- Configuration Audits

(As Built Configuration List)

- •Complete Full Functional Analysis Complete
- Pre-Environmental Test Alignments Complete

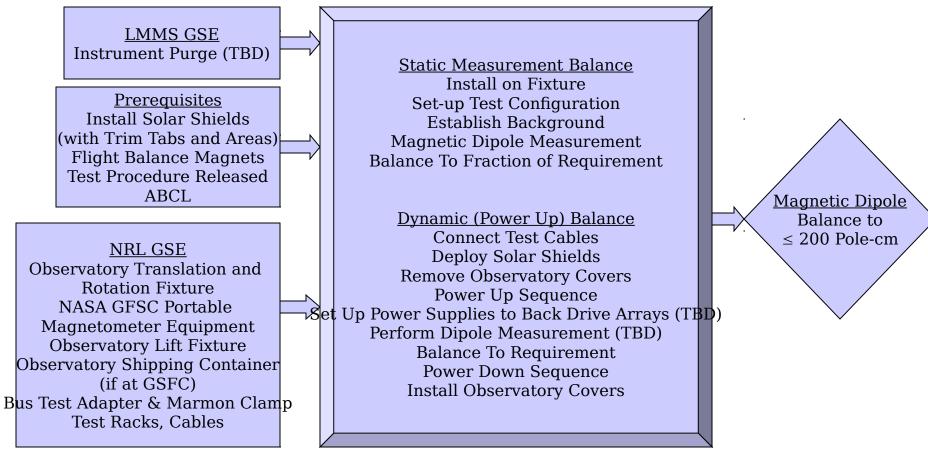
(Test Baseline)





Magnetic Balance (@NRL, or GSFC)

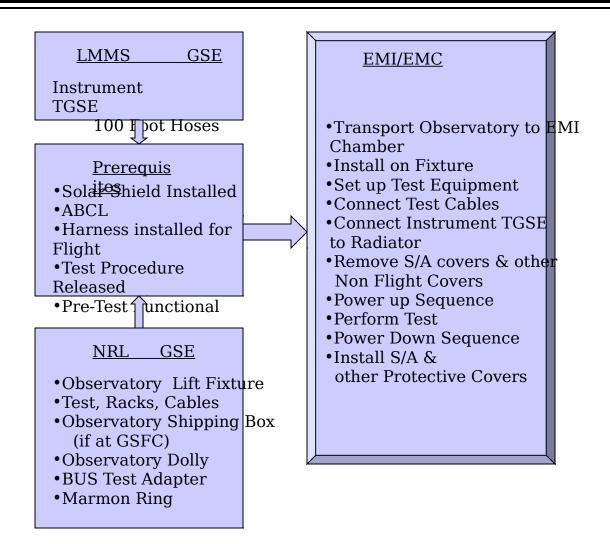






EMI/EMC @NRL or GSFC

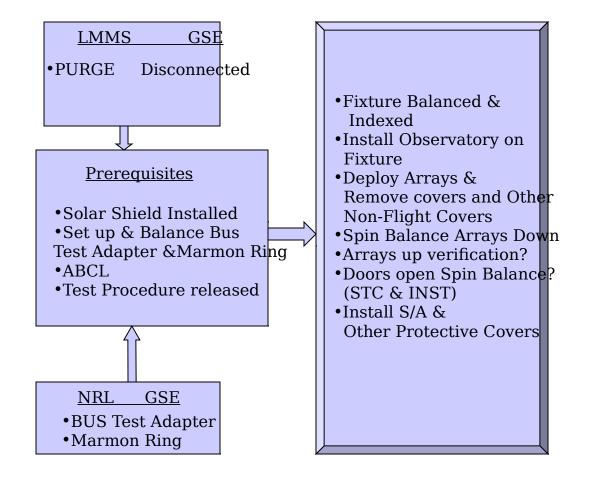






Spin Balance & Mass Properties

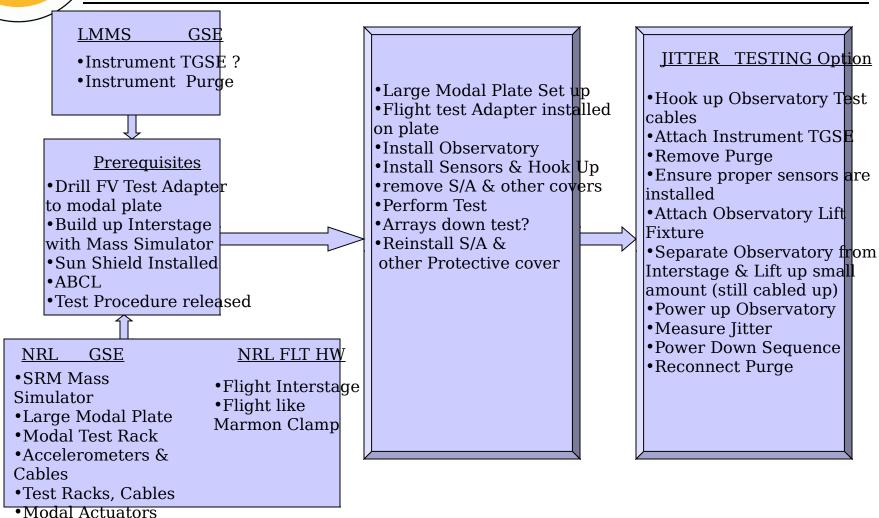






Modal Testing





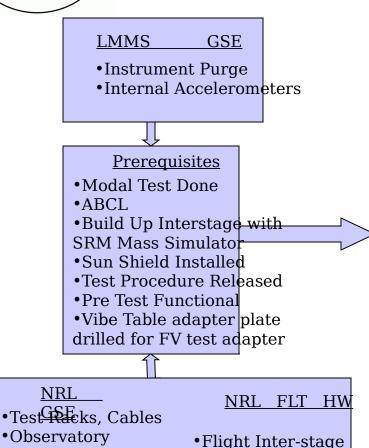
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•FV Test Adapter



Lateral Random Vibration





• Flight Marmon Clamps

• FV Test Adapter installed on Vibe table •Install Accelerometers on Observatory & Interstage Connect Instrument internal **Accelerometers** •Install FV on Test Adapter • Hook Up EGSE Cables •Remove S/A Covers & other covers Power Up functions active at Launch Perform test, notch as reg'd • Perform Post Test Functional

•Install S/A Covers & other

FIRST LATERAL AXIS

SECOND LATERAL AXIS

- •Rotate Test Article 90º
- Verify Instrumentation
- •Remove S/A Covers & other covers
- Power Up functions active
- at Launch
- Perform Test. Notch as Reg's
- Perform Post Test **Functional**
- Power Down
- •Install S/A Covers & other
- covers
- Disconnect

Accelerometers & Test Cables for move

•Install FV on

Transport Dolly

SRM Mass Simulator

Transport Dolly

Fixture

Observatory Lift

•FV Test Adapter

FAME Technical Int

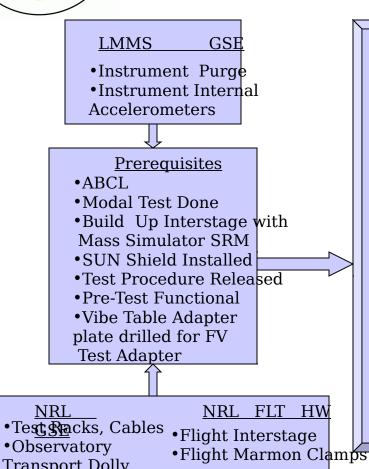
• Power Down

covers



Axial Random Vibration & Acoustic





AXIAL RANDOM VIBRATION

- •FV Test Adapter Installed in Acoustic Chamber
- Hook Up Bus & Instrument Accelerometers cables
- Hook up EGSE Cables
- •Remove S/A & other Covers
- Power Up Functions active at Launch
- Perform Test, notch as Required
- Perform Post Test Functional
- Power Down
- Reinstall S/A & other Covers

ACOUSTIC

- Set up acoustic chamber for Acoustic Test.
- Disconnect Purge
- •Remove S/A & other Covers
- Power up Functions active at Launch
- Perform Lower Level Test. check responses
- Perform Full Level Test
- Perform Post Test Functional
- Power Down
- •Install S/A Covers & other covers
- •Reconnect Purge

Transport Dolly

•Observatory Lift **Fixture**

•FV Test Adapter



Pyro Shock Mechanism Deployment



LMMS

GSE

- •Instrument Purge
- Instrument. Internal Accelerometers

Prerequisites

- Vibe & Acoustic Done
- ABCL
- •Test Procedure released
- SUN Shield Installed
- Pre-Test Functional
- •MLI on S/A & BUS to look for snags

NRL

- •TeskRacks, Cables
- Firing Rack
- •Observatory Lift

Fixture

- •FV Test Adapter
- •SRM Mass Simulator

NRL FLT HW

•ARM Plugs

OBSERVATORY-

INTERSTAGE

- •FV Still in Acoustic Chamber
- Purge still on
- Hook Up Observatory Lift Fixture Remove Slack (offload?)
- •Accelerometer &

Test Cables Still Hooked up

- Install any new shock accels or hookup ones previously installed
- •Remove S/A & other Covers
- Power up Functions active at Separation
- Perform Test.
- •Separate Observatory from Inter-Stage enough to activate SEP Switch Power Down
- Post Test Functional
- Power Down
- •Set Observatory down on Dolly
- •Install S/A Covers & other covers
- •Disconnect Accelerometer & Test Cables for move

SOLAR ARRAY

- Move Observatory to location
- for S/A Deployment
- •Install Observatory on special

test fixture if required

- •Connect up shock accelerometers
- Connect up EGSE Cables
- •Remove S/A & other covers
- Power up functions active at deploy
- •Perform test
- Post Test Functional
- •Install S/A covers & other covers
- Restow or remove Arrays
- Disconnect Cables, remove accelerometers
- Put Observatory on

Transport Dolly





Thermal Vacuum (TVAC)



LMMS GSE

•Instrument Purge

Prerequisites

- •Vibe & Acoustic Completed
- •Chamber Trolley drilled to accept observatory Test Adapter
- •Remove MLI if installed for S/A Deployment testing
- •Test Procedure Released
- •ABCL

NRL

- •Cha**66SE**r Test Cables
- Observatory Lift Fixture
- •Observatory Test Adapter
- •Chamber Trolley & Plate
- Marmon clamp
- •Video Camera & Monitor

Test Set up

- •Chamber Plate on Trolley, under crane footprint
- •Mount Observatory test adapter on plate
- •With Observatory on Ground install thermocouples & Verify
- Mount Observatory on Adapter Plate
- •Remove Antenna Protective covers
- •Roll trolley to chamber & install Plate in chamber
- Hook Up test cables & verify
- •Ensure That INST door bagging material is clear of INST door
- Set up Video camera to view Doors

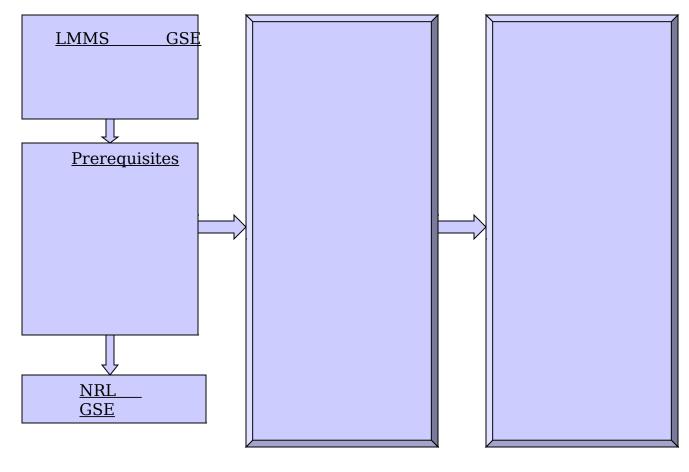
TVAC Test

- Perform open door functional Test
- •Close door, perform functional test
- Pull vacuum perform ambient temperature functional test
- •Go Hot with FPA heaters on (drive off H20 & Volatiles)
- Perform 3 Thermal Cycles with Functional test at each extreme
- •At appropriate time, deploy Instrument covers
- •Warm up test article
- Open Door
- •Close Instrument doors
- Attach purge
- •Remove Observatory from chamber
- •Install protective covers
- Place Observatory on transport Doll



End to End Compatibility

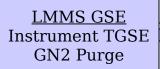






Post Environmental Test Full Functional



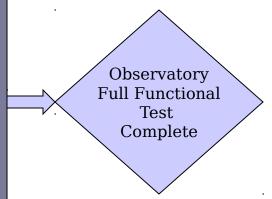


Instr to S/C Procedure Release
NRL Prereq
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NRL GSE Space craft EGSE Test Cables Antenna Hats Test Racks

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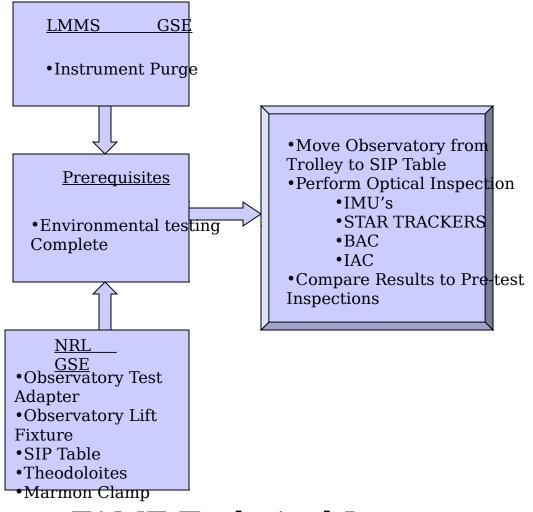


24-25 Apri



Post Environmental Test Alignment Verification





24-25 Apri

FAME Technical Int



Pre-Ship Readiness



Review

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